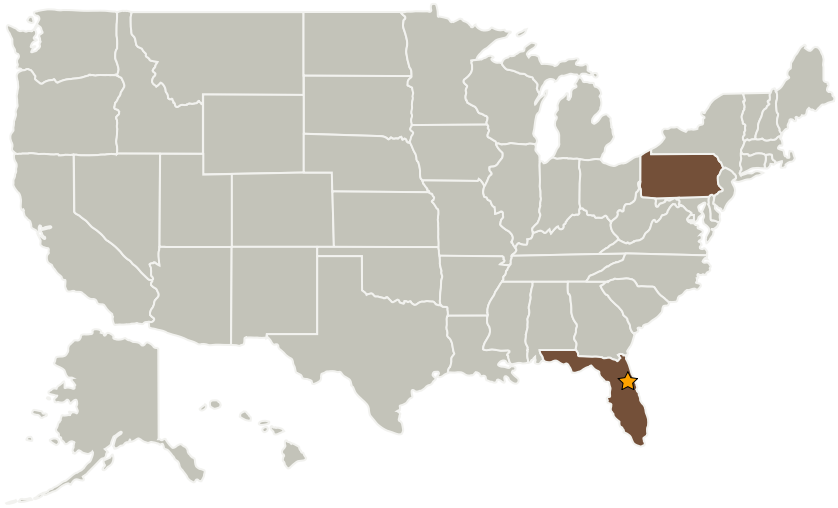
Nano-Phase Powder Based Exothermic Braze Repair Technology For RCC Materials, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

MRi is proposing, with its partner, Exotherm Corp (Camden, NJ) to demonstrate the feasibility of using exothermic brazing to join RCC (or C:SiC) composites to itself and/or to metal structures as an in orbit repair technique. The proposed Phase I work would be aimed at developing powder based brazing performs that would contain elements and compounds in powder particles that have been formed to have nano-phase dispersions of reactant compounds. These powder based performs would be placed in joints that upon ignition by spark or laser would self-propagate, releasing sufficient heat to braze reinforced carbon:carbon (RCC) composite materials to RCC or to refractory metals such as tantalum or niobium. In the proposed effort MRi and Exotherm will produce nano-phase particles of two candidate precursor materials (Ti-Si-C-based and WO3-Al-Zr-SiO2), demonstrate their exothermic properties, make RCC/RCC and RCC/(Nb or)Ta joints, characterize the joints and run lap shear strength The goal is to advance innovative, cost effective and reliable joining processes that would enable the in-flight repair of space shuttle or other reentry vehicles structures where RCC is being used. Although RCC structure repair is the specific application that is targeted, exothermic brazing technology would offer opportunity in the assembly of structures in space and on interplanetary missions, where high-energy heat sources would be difficult or impossible to use for in-flight joining, assembly and/or repair.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
Materials Resources International	Supporting Organization	Industry	Lansdale, Pennsylvania

Primary U.S. Work Locations	
Florida	Pennsylvania

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Ronald Smith

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.1 Manufacturing Processes